

Managed Burn Estimating Smoke Emissions

Presented for the
California Fuels Committee
McClellan AFB, Sacramento
November 9, 2006

California Air Resources Board
Emission Inventory Branch



Overview

- Smoke Emission Estimation Methods
 - Forest Burning - Emission Estimation System (EES) Model
 - Ag and Other Managed Burning - Emission Factors and Fuel Loading Table
- Emission Inventories
- Real Examples
- Run EES Model – Live
- Run FOFEM



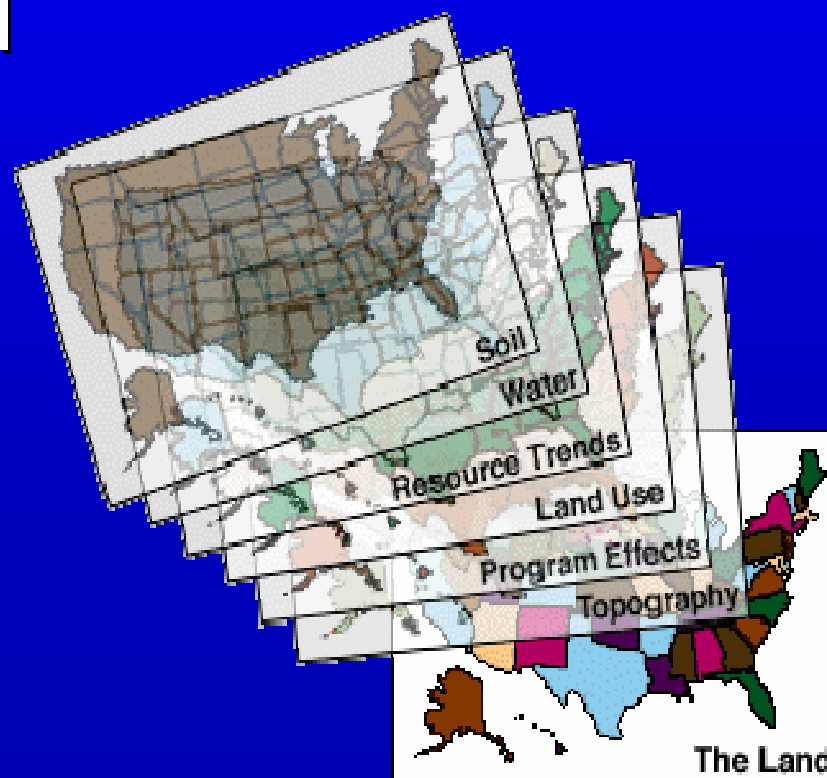
Why We Estimate Emissions

- SIPs – State Implementation Plans
- Modeling – dispersion and photochemical
- Planning – analysis, permits, SMP
- Evaluate the sources of air pollution
 - contribution of different sources
 - regional & seasonal variations
- Prioritize and compare all sources
- Help evaluate potential health impacts



Where We're Headed

- Title 17 reporting requirements
- Prescribed Fire Incident Reporting System (PFIRS)
- Agricultural & residential burn improvements
- UC Berkeley wildlands emissions project
- GIS based estimates
- Year specific, month specific (vs. averages)



Presentation - What to Expect

- Smoke emission estimation methods
 - Emission factor table
 - EES model - walk through how the model works
- ARB Emission Inventor
 - planning vs. modeling
 - structure & responsibility
- Reporting – format, data and Title 17 requirements
- Projecting burn emission
- Open GIS and Run EES Model



Anthropogenic Sources Miscellaneous Processes				Natural Sources (Non- Anthropogenic)
Managed Burning and Disposal (Waste Burning)			Residential Fuel Combustion	Wildfires – All Vegetation
Ag Burning¹	Prescribed Fire²	Other Burning³		
Ag-Field ^a (670-662-0262- 0000)	Forest Management ^d (670-666- 0200-0000)	Non-Ag Open Burning ^g (670-670-0200- 0000)	Fireplaces (610-600- 0230-0000)	Wildfires–All Vegetation (930-934-0200- 0000)
Ag-Pruning ^b (670-660-0262- 0000)	WFU ^e (670-667- 0200-0000)	Other ^h (670-995-0240- 0000)	Wood Stoves (610-600- 0230-0000)	
Weed Abatement ^c (670-668-0200- 0000)	Range Improvement ^f (670-664- 0200-0000)			

1. *Burning related to agricultural activity*

- a. Ag-Field –Burning of field and row crop residue.
- b. Ag-Pruning – Burning of orchard pruning/clippings.
- c. Weed Abatement - Burning to control weeds, primarily in irrigation canals.

2. *Burning related to public land management, primarily forest*

- d. Forest Management - Prescribed forest burning primarily by public land management agencies. This category also includes pile burning.
- e. WFU (Wildland Fire Use) Fire – A lightning ignited fire managed for resources benefit (unsuppressed).
- f. Range Improvement – primarily the burning of grass and chaparral for cattle grazing.

3. *All other burning*

- g. Non-Ag Open Burning – backyard or barrel burning of waste.
- h. Other – other types of permitted burning such as diseased animals and flood debris.



Links

Methods - Smoke Emissions Estimation Web Page:

<http://www.arb.ca.gov/ei/see/see.htm>

Inventory – Almanac (snapshot of CEFS):

<http://www.arb.ca.gov/html/aqe&m.htm>

Inventories- CEIDARS & CEFS:

<http://www.arb.ca.gov/app/emsinv/dist/>



Estimating Emissions

Managed Burn and Disposal

Emission Factor Table





Emission Factor Table Categories

Agricultural Burning

Pruning - orchards

Field Crops - row crop

Weed Abatement - roadside, canals, fence line etc.

Range Improvement - Chaparral, grass lands, and grazing land

Waste Burning (unspecified) - flood debris, raisin trays

Forest Burning - slash (can be used for pile burning)





Emission Factor Table

Crop Code	Crop Name	EIC Description	EIC Code	Emission Factors (lbs/ton)						Fuel Loading (tons/acre)
				PM 10	PM 25	NOX	SO2	VOC	CO	
Agriculture - Field Crops										
241	Alfalfa	Agriculture - Field Crop	670-662-0262-00	28.50	27.20	4.50	0.60	21.70	119.00	0.800
247	Asparagus	Agriculture - Field Crop	670-662-0262-00	40.00	39.34	4.49	0.61	66.00	150.00	1.500
242	Barley	Agriculture - Field Crop	670-662-0262-00	14.30	13.80	5.10	0.10	15.00	183.70	1.700
243	Bean/pea	Agriculture - Field Crop	670-662-0262-00	13.70	13.00	5.20	0.10	14.20	148.00	2.500
244	Corn	Agriculture - Field Crop	670-662-0262-00	11.40	10.90	3.30	0.40	6.60	70.90	4.200
245	Cotton	Agriculture - Field Crop	670-662-0262-00	15.90	15.18	4.49	0.61	10.73	113.95	2.175
609	Dried flowers	Agriculture - Field Crop	670-662-0262-00	15.90	15.18	4.49	0.61	10.73	113.95	2.175
246	Flax	Agriculture - Field Crop	670-662-0262-00	15.90	15.18	4.49	0.61	10.73	113.95	2.175
609	Flower straw	Agriculture - Field Crop	670-662-0262-00	15.90	15.18	4.49	0.61	10.73	113.95	2.175
612	Nursery prunings	Agriculture - Field Crop	670-662-0262-00	15.90	15.18	4.49	0.61	10.73	113.95	2.175
248	Oats	Agriculture - Field Crop	670-662-0262-00	20.70	19.70	4.50	0.60	10.30	136.00	1.600
255	Other field crops	Agriculture - Field Crop	670-662-0262-00	15.90	15.18	4.49	0.61	10.73	113.95	2.175
260	Pea vines	Agriculture - Field Crop	670-662-0262-00	13.70	13.00	5.20	0.10	14.20	148.00	2.500
249	Peanuts	Agriculture - Field Crop	670-662-0262-00	15.90	15.18	4.49	0.61	10.73	113.95	2.175
250	Rice	Agriculture - Field Crop	670-662-0262-00	6.30	5.90	5.20	1.10	4.70	57.40	3.000
251	Rye	Agriculture - Field Crop	670-662-0262-00	15.90	15.18	4.49	0.61	10.73	113.95	2.175
252	Safflower	Agriculture - Field Crop	670-662-0262-00	17.70	16.90	4.50	0.60	14.80	144.00	1.300

Example Equation Emission Factor Table

10 acres Apricot – **Code # 103** (Prunings)

Fuel Loading Factor: $(10 \text{ ac}) * (1.8 \text{ tons/ac}) = 18 \text{ tons Apricot prunings}$
PM10 Emission Factor: $(18 \text{ tons}) * (5.9 \text{ lbs PM10/ton}) = 106.2 \text{ lbs PM10}$
Convert lbs to tons: $(106.2 \text{ lbs}) * (1 \text{ ton}/2000\text{lbs}) = 0.0531 \text{ tons PM10}$

250 acres Ditchbank and Canal – **Code # 362** (Weed Abatement)

Fuel Loading Factor: $(250 \text{ ac}) * (2.175 \text{ tons/ac}) = 543.75 \text{ tons}$
VOC Emission Factor: $(543.75 \text{ tons}) * (10.73 \text{ lbs VOC/ton}) = 5,834.44 \text{ lbs VOC}$
Convert lbs to tons : $(5,834.44 \text{ lbs}) * (1 \text{ ton}/2000\text{lbs}) = 2.9172 \text{ tons VOC}$



Emission Estimation System

EES Model



Corbis.com

Overview

- 🌐 EES Model - how it works
- 🌐 Spatial GIS component
- 🌐 Inputs
- 🌐 Methods
- 🌐 User adjusted perimeters - user interface
- 🌐 Assumptions
- 🌐 Results



Wildfire Definition

A natural event that burns a variety of vegetation types ranging in age, size and density; caused by natural and human activity such as lightning or arson, and suppressed by fire fighters.

WFU - Wildland Fire Use Fire

A lightning ignited fire managed for resources benefit.

Prescribed Burn

Forest fire ignited by a planned management action.

Forest Burn Emission Estimates

- **GIS** - Geographic Information System
- **EES** - Emission Estimation System (EES)
- Emission calculation methodology – FOFEM
- Emission Factors - ARB & FOFEM
- Moisture Input – WFAS Th-FM
- Activity data – GIS shapefiles
- Vegetation Input – GAP Layer
- EI Categories - **Wildfires, Rx, WFU & Range Burning**

Inputs

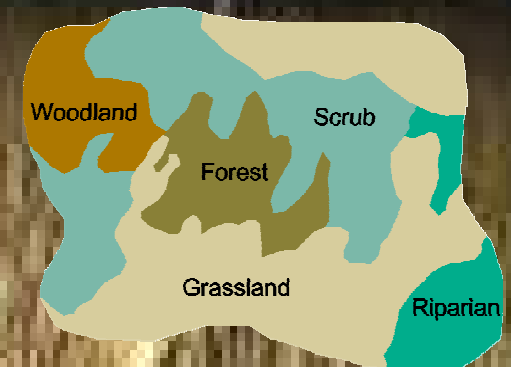
- **FOFEM 4.0** - U.S. Forest Service FOFEM (First Order Fire Effects Model)
 - Smoke emission estimation methodology
 - Fuel loading by fuel component crosswalked to CA vegetation
- **GAP Layer** - vegetation landcover of CA
- **Thousand-Hour Fuel Moisture Grid** - moisture input
- **Emission Factors** - PM10, PM2.5, CO, TNMCH, CH4, NH3, NO_x, SO2
- **Fire Perimeter Footprint**
 - GIS shapefiles input
 - Digitize, on the fly



+



=



Wildfire footprint is overlaid on GAP vegetation layer, calculating the amount of each fuel consumed in the fire. Fuel loading is assigned for each fuel component that make up the vegetation type.

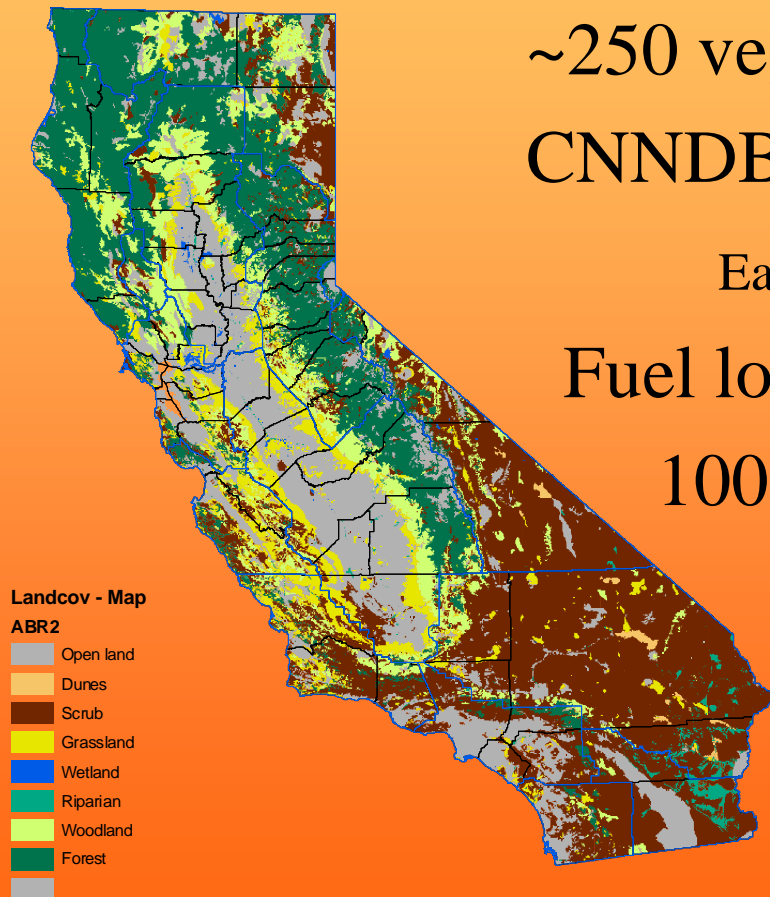
GAP Vegetation

~250 vegetation types
CNNDB classification

Each crosswalked to fuel model

Fuel loading - typical, sparse & abundant
100 hectare minimum mapping unit

Statewide data





Fuel Models

Fuel Loading by fuel Components

Vegetation Type
fuel loading by fuel
component
(Tons/Acre)

- Canopy fuels
- Ladder fuels
- Shrub
- Regeneration
- Herbaceous
- 0-1 inch diameter down wood
- 1-3 inch diameter down wood
- 3+ inch diameter down wood
- Litter
- Duff



Fuel Components Cont...

Canopy Fuels

Tree Tops



Lateral Fuels

Ladder branches along
a tree that lead to canopy



Fuel Components Cont...

Shrubs
Brush - Chaparral



Herbaceous
Grass



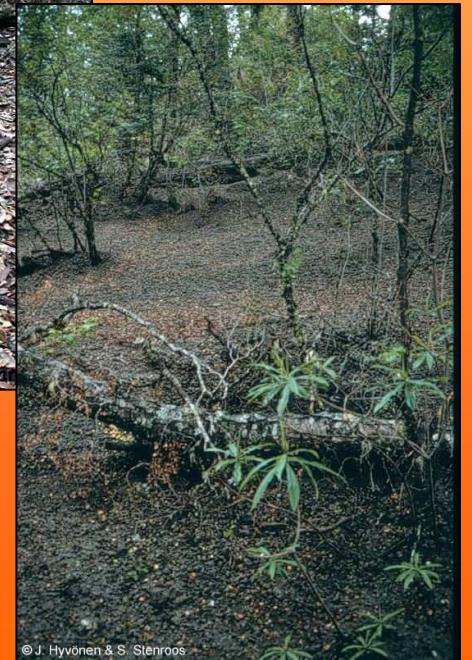
Regeneration
Saplings & New Growth



Fuel Components Cont...

Dead and down woody fuel

- 3 + inch diameter (Thousand hour fuels)
- 1-3 inch diameter
- 0-1 inch diameter



Fuel Components Cont...

Litter

Forest floor litter
Pine cones & needles



Duff

Partially decomposed
organic matter
beneath litter





Emission Factors

by fuel component (lbs/ton)

	PM10			PM2.5			N2O			CH4			CO2		
Fuel Component	Wet	Mod	Dry	Wet	Mod	Dry	Wet	Mod	Dry	Wet	Mod	Dry	Wet	Mod	Dry
Litter, wood 0-1 in	9.3	9.3	9.3	7.9	7.9	7.9	0.5	0.5	0.5	2.1	2.1	2.1	3,482.7	3,482.7	3,482.7
Wood 1-3 in	14	14	14	11.9	11.9	11.9	0.5	0.5	0.5	4.5	4.5	4.5	3,372.7	3,372.7	3,372.7
Wood 3+ in	26.6	21.6	19.1	22.5	18.3	16.2	0.4	0.4	0.4	10.8	8.2	7	3,079.4	3,196.8	3,255.4
Herb, shrub, regen	25.1	25.1	25.1	21.3	21.3	21.3	0.4	0.4	0.4	10	10	10	3,116.1	3,116.1	3,116.1
Duff	28.2	30.4	30.4	23.9	25.8	25.8	0.4	0.4	0.4	11.5	12.6	12.6	3,042.8	2,991.5	2,991.5
Canopy Fuels	25.1	25.1	25.1	21.3	21.3	21.3	0.4	0.4	0.4	10	10	10	3,116.1	3,116.1	3,116.1
	TNMHC			NH3			NOx			SO2			CO		
Fuel Component	Wet	Mod	Dry	Wet	Mod	Dry	Wet	Mod	Dry	Wet	Mod	Dry	Wet	Mod	Dry
Litter, wood 0-1 in	3.7	3.7	3.7	0.5	0.5	0.5	8.2	8.2	8.2	2.5	2.5	2.5	52.4	52.4	52.4
Wood 1-3 in	7.8	7.8	7.8	1.1	1.1	1.1	8	8	8	2.5	2.5	2.5	111.4	111.4	111.4
Wood 3+ in	18.8	14.4	12.2	2.7	2.1	1.7	7.3	7.6	7.7	2.2	2.3	2.4	268.9	205.8	174.4
Herb, shrub, regen	17.4	17.4	17.4	2.5	2.5	2.5	7.4	7.4	7.4	2.3	2.3	2.3	249.2	249.2	249.2
Duff	20.2	22.1	22.1	2.9	3.2	3.2	7.2	7.1	7.1	2.2	2.2	2.2	288.6	316.1	316.1
Canopy Fuels	17.4	17.4	17.4	2.5	2.5	2.5	7.4	7.4	7.4	2.3	2.3	2.3	249.2	249.2	249.2



EES Parameters

Wildland Fire Emissions Estimation System - General Fuel Input

Welcome to the Wildland Fire Emission System for PC

Select a fire input theme or year

☒ Select a fire theme for analysis.

Cojo-Jalama Fire

☐ Select a year for analysis.

☐ Activate special GAP processing!

Define the fire input parameters

Fuel Category: Natural

Dead fuel adjustment factor: Typical

Moisture conditions: Very dry

Fire intensity: Extreme

Will this fire burn tree crowns: ☒ Yes ☐ No

Tree crown biomass burning: Typical

Herbaceous density: Typical

Shrub density: Typical

Tree regeneration density: Typical

Enter NFDR-TH moisture 20 %

☐ Get NFDR-TH Moisture from

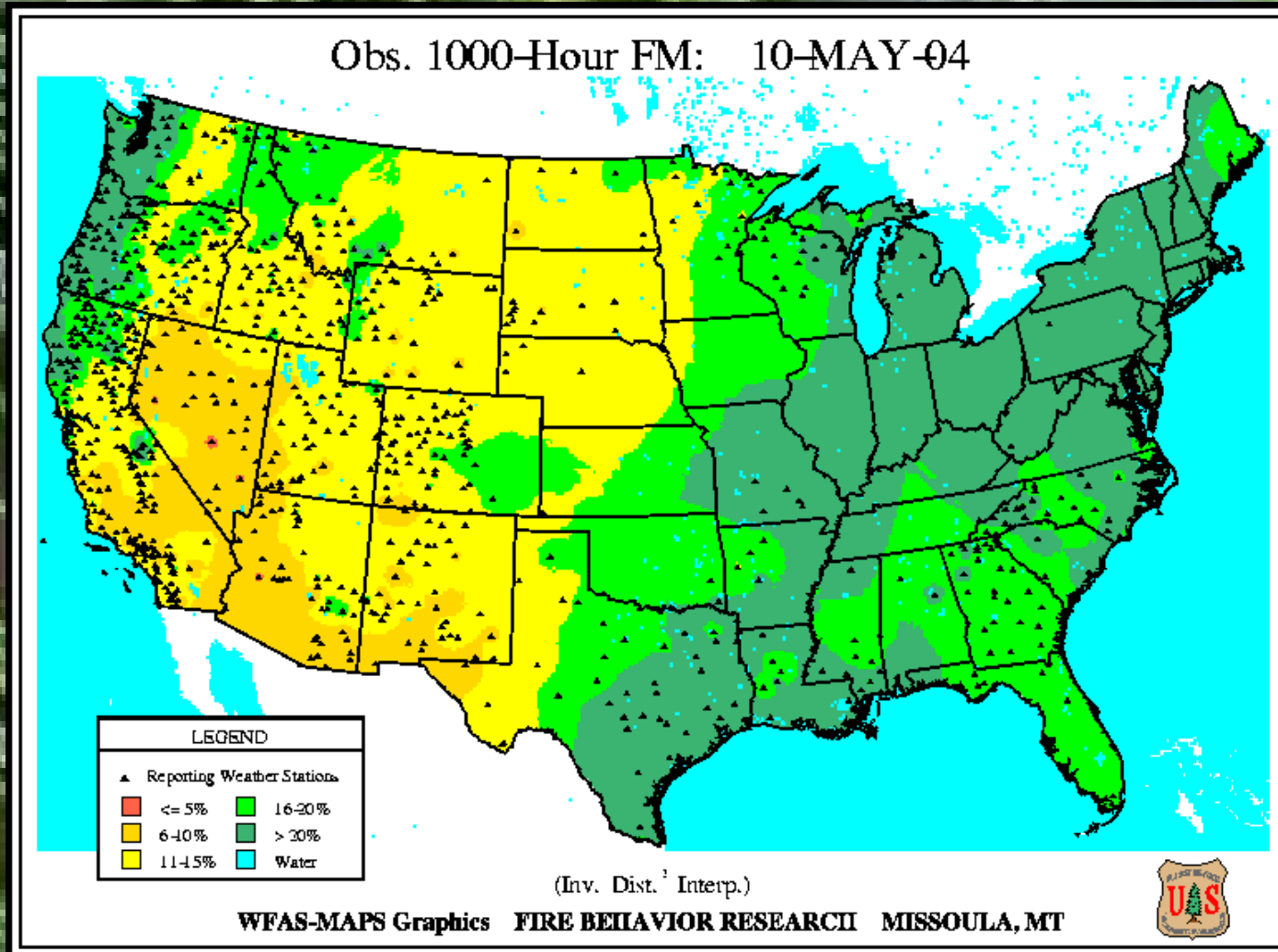
Path to NFDR-TH moisture grids:

Browse...

Help Cancel Next



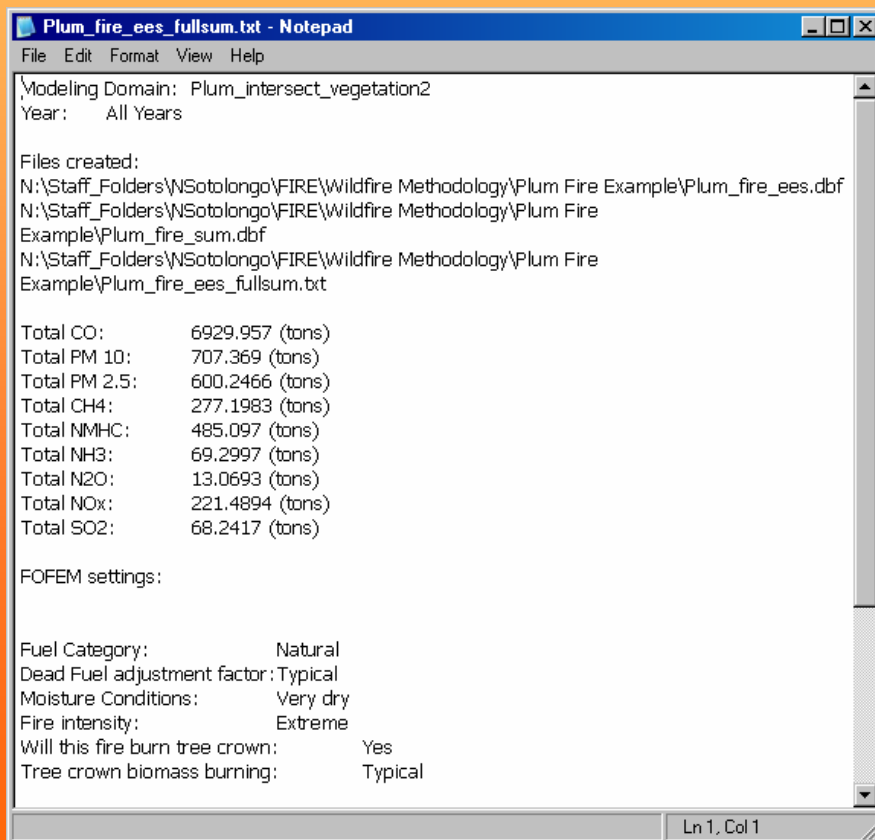
Thousand-Hour Fuel Moisture





Outputs Files

EES_fullsum.txt:



```
Plum_fire_ees_fullsum.txt - Notepad
File Edit Format View Help
Modeling Domain: Plum_intersect_vegetation2
Year: All Years

Files created:
N:\Staff_Folders\NSotolongo\FIRE\Wildfire Methodology\Plum Fire Example\Plum_fire_ees.dbf
N:\Staff_Folders\NSotolongo\FIRE\Wildfire Methodology\Plum Fire
Example\Plum_fire_sum.dbf
N:\Staff_Folders\NSotolongo\FIRE\Wildfire Methodology\Plum Fire
Example\Plum_fire_ees_fullsum.txt

Total CO: 6929.957 (tons)
Total PM 10: 707.369 (tons)
Total PM 2.5: 600.2466 (tons)
Total CH4: 277.1983 (tons)
Total NMHC: 485.097 (tons)
Total NH3: 69.2997 (tons)
Total N2O: 13.0693 (tons)
Total NOx: 221.4894 (tons)
Total SO2: 68.2417 (tons)

FOFEM settings:

Fuel Category: Natural
Dead Fuel adjustment factor: Typical
Moisture Conditions: Very dry
Fire intensity: Extreme
Will this fire burn tree crown: Yes
Tree crown biomass burning: Typical

Ln 1, Col 1
```

EES_sum.dbf

Emissions by fire polygon

EES.dbf - Most detailed

- Fuel loading and emissions by
 - Vegetation classification
 - Fuel component
 - Fire polygon
- Acres of each veg type by polygon

Example 1 - Plum Fire

Fire Name: Plum Fire

Date: November 12, 2002

Size: 1762 acres

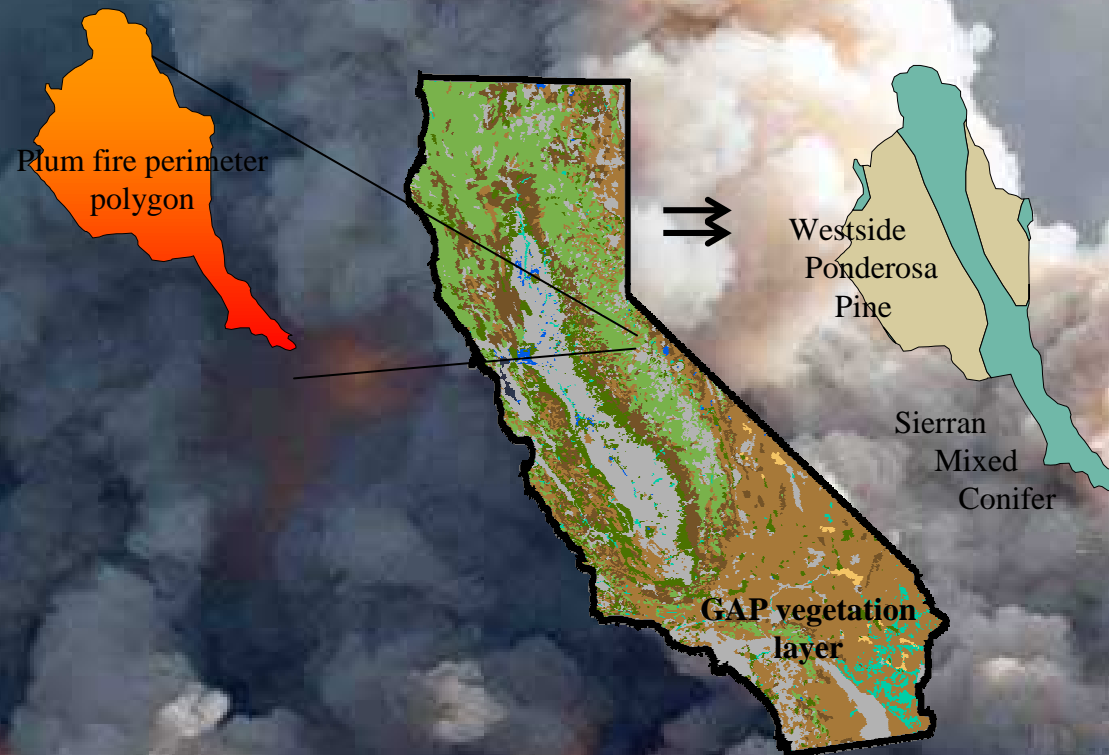
Location: El Dorado County
Mountain Counties AB

Elevation: ~5000 ft

Vegetation: Sierran Mixed Conifer
Western Ponderosa Pine



Plum Fire

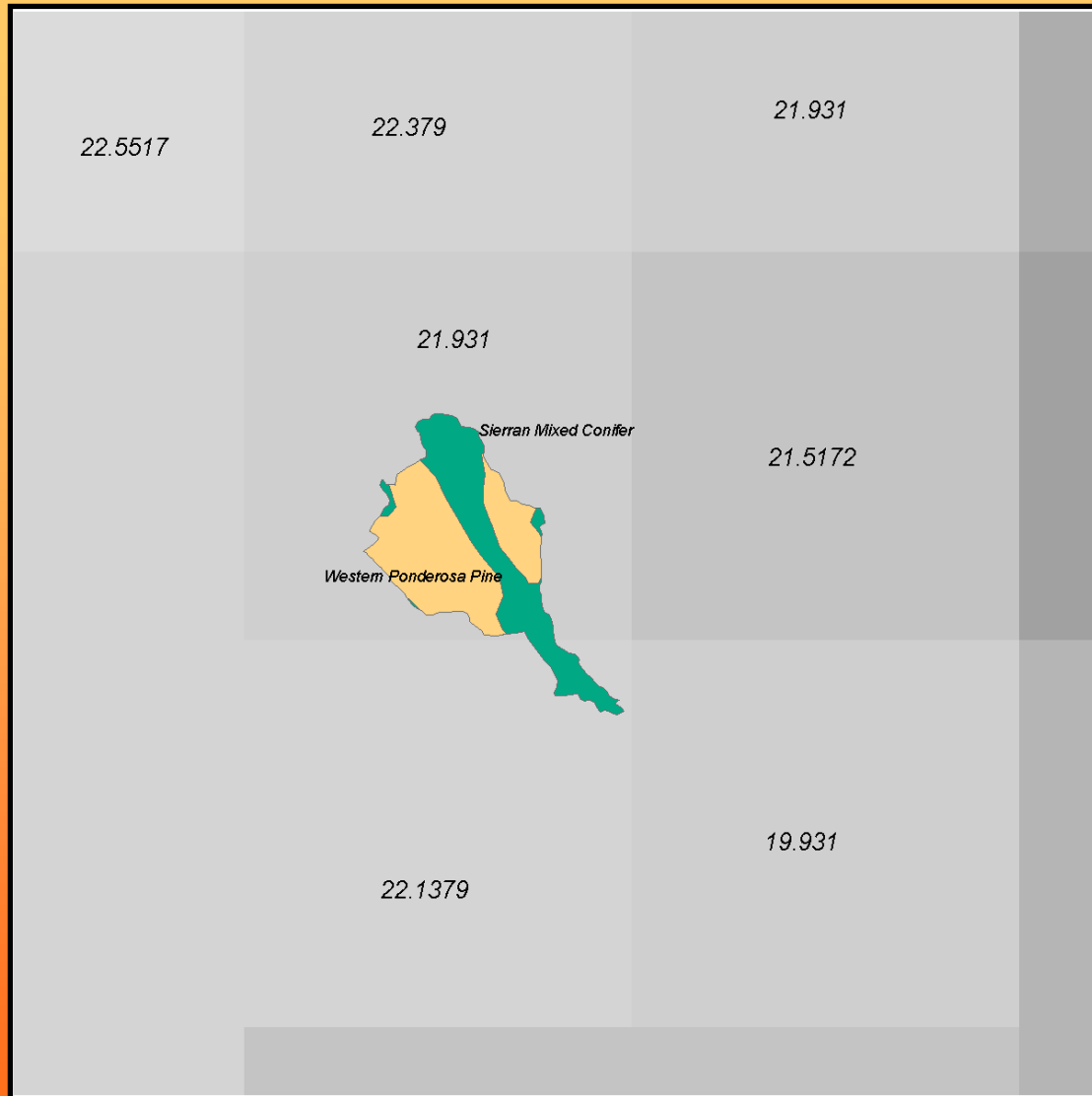


Fuel Components Consumption



	<i>Sierra Nevada Mixed Conifer</i>		
Fuel Component	Fuel Loading	Consumption Assumption	Total Consumed
Litter	1.8	100%	1.8
Wood 0-1 inch	1.3	90%	1.2
Wood 1-3 inch	1.9	65%	1.2
Wood 3+ inch	32.0	NFDR-TH	NFDR-TH
Duff	56.0	NFDR-TH	NFDR-TH
Herbaceous	0.2	100%	0.2
Shrub	0.3	60%	0.2
Tree regeneration	0.1	60%	0.1
Canopy branchwood	3.0	50%	1.5
Canopy foliage	6	100%	6.0





Thousand Hour Moisture Grid





TH-HR Fuel Moisture

<i>Sierra Nevada Mixed Conifer</i>				
Fuel Component	<i>Fuel Loading</i>	<i>Flaming</i>	<i>Smoldering</i>	<i>Total Consumed</i>
Litter	1.8	--	--	1.8
Wood 0-1 inch	1.3	--	--	1.2
Wood 1-3 inch	1.9	--	--	1.2
Wood 3+ inch	32.0	21.5	5.4	26.9
Duff	56.0	15.5	23.2	38.7
Herbaceous	0.2	--	--	0.2
Shrub	0.3	--	--	0.2
Tree regeneration	0.1	--	--	0.1
Canopy branchwood	3.0	--	--	1.5
Canopy foliage	6	--	--	6.0



Final PM10 Emissions

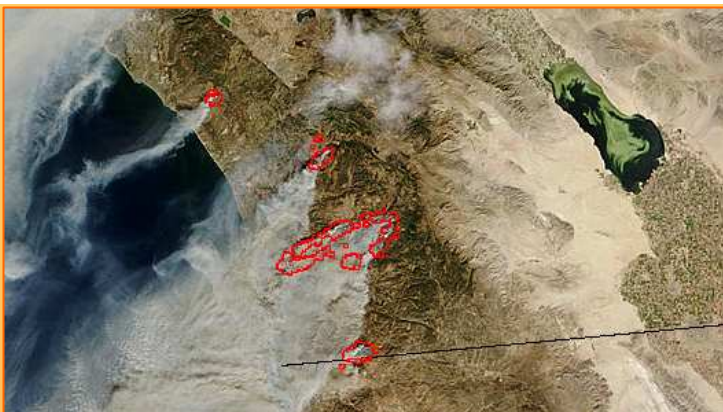
Westside
Ponderosa
Pine



Sierran Mixed
Conifer

Fuel Component	Westside Ponderosa Pine	Sierran Mixed Conifer	Plum Fire Total Fuel Loading (tons)	Fuel Consumption (percent)	Fuel Consumed (tons)	PM10 Emission Factors (lbs/ton)	PM10 Emissions (lbs)	PM10 Emissions (tons)
	Acres * Fuel Loading							
Litter	1,416.8	1,125.0	2,541.8	100%	2,541.8	9.3	23,638.7	11.8
Wood 0-1 inch	708.4	750.0	1,458.4	90%	1,312.6	9.3	12,206.8	6.1
Wood 1-3 inch	809.6	1,125.0	1,934.6	65%	1,257.5	14.0	17,604.9	8.8
Wood 3+ inches	5,060.0	15,000.0	20,060.0	82% ⁽¹⁾	16,451.6	19.1 ⁽³⁾	314,225.0	157.1
Herbs	202.4	150.0	352.4	100%	352.4	25.1	8,845.2	4.4
Shrubs	253.0	187.5	440.5	60%	264.3	25.1	6,633.9	3.3
Regen	151.8	112.5	264.3	60%	158.6	25.1	3,980.4	2.0
Duff	5,060.0	30,000.0	35,060.0	34% ⁽²⁾	12,088.7	30.4 ⁽³⁾	367,496.1	183.7
Canopy foliage	6,072.0	4,500.0	10,572.0	100%	10,572.0	25.1	265,357.2	132.7
Canopy branchwood	708.4	2,250.0	2,958.4	50%	1,479.2	25.1	37,127.9	18.6
							Total	528.6





“EES.dbf” Output

COMPONENT	PRELOAD	PM10	AREA	PM10TOT	FIRES_	COVERDESC
Litter	1.50	13.9	687.70	4.7967	0	SIERRAN MIXED CONIFER FOREST
Wood 0-1 inch	1.00	8.4	687.70	2.8780	0	SIERRAN MIXED CONIFER FOREST
Wood 1-3 inch	1.50	13.6	687.70	4.6935	0	SIERRAN MIXED CONIFER FOREST
Wood 3+ inches	20.00	382.0	687.70	131.3506	0	SIERRAN MIXED CONIFER FOREST
Herbs	0.20	5.0	687.70	1.7261	0	SIERRAN MIXED CONIFER FOREST
Shrubs	0.25	3.8	687.70	1.2946	0	SIERRAN MIXED CONIFER FOREST
Regen	0.15	2.3	687.70	0.7768	0	SIERRAN MIXED CONIFER FOREST
Duff	40.00	748.4	687.70	257.3460	0	SIERRAN MIXED CONIFER FOREST
Canopy foliage	6.00	150.6	687.70	51.7838	0	SIERRAN MIXED CONIFER FOREST
Canopy branchw ood	3.00	37.7	687.70	12.9459	0	SIERRAN MIXED CONIFER FOREST
Litter	1.40	13.0	551.43	3.5898	1	WESTSIDE PONDEROSA PINE FOREST
Wood 0-1 inch	0.70	5.9	551.43	1.6154	1	WESTSIDE PONDEROSA PINE FOREST
Wood 1-3 inch	0.80	7.3	551.43	2.0072	1	WESTSIDE PONDEROSA PINE FOREST
Wood 3+ inches	5.00	95.5	551.43	26.3309	1	WESTSIDE PONDEROSA PINE FOREST
Herbs	0.20	5.0	551.43	1.3841	1	WESTSIDE PONDEROSA PINE FOREST
Shrubs	0.25	3.8	551.43	1.0381	1	WESTSIDE PONDEROSA PINE FOREST
Regen	0.15	2.3	551.43	0.6228	1	WESTSIDE PONDEROSA PINE FOREST
Duff	5.00	93.6	551.43	25.7941	1	WESTSIDE PONDEROSA PINE FOREST
Canopy foliage	6.00	150.6	551.43	41.5228	1	WESTSIDE PONDEROSA PINE FOREST



Example 2

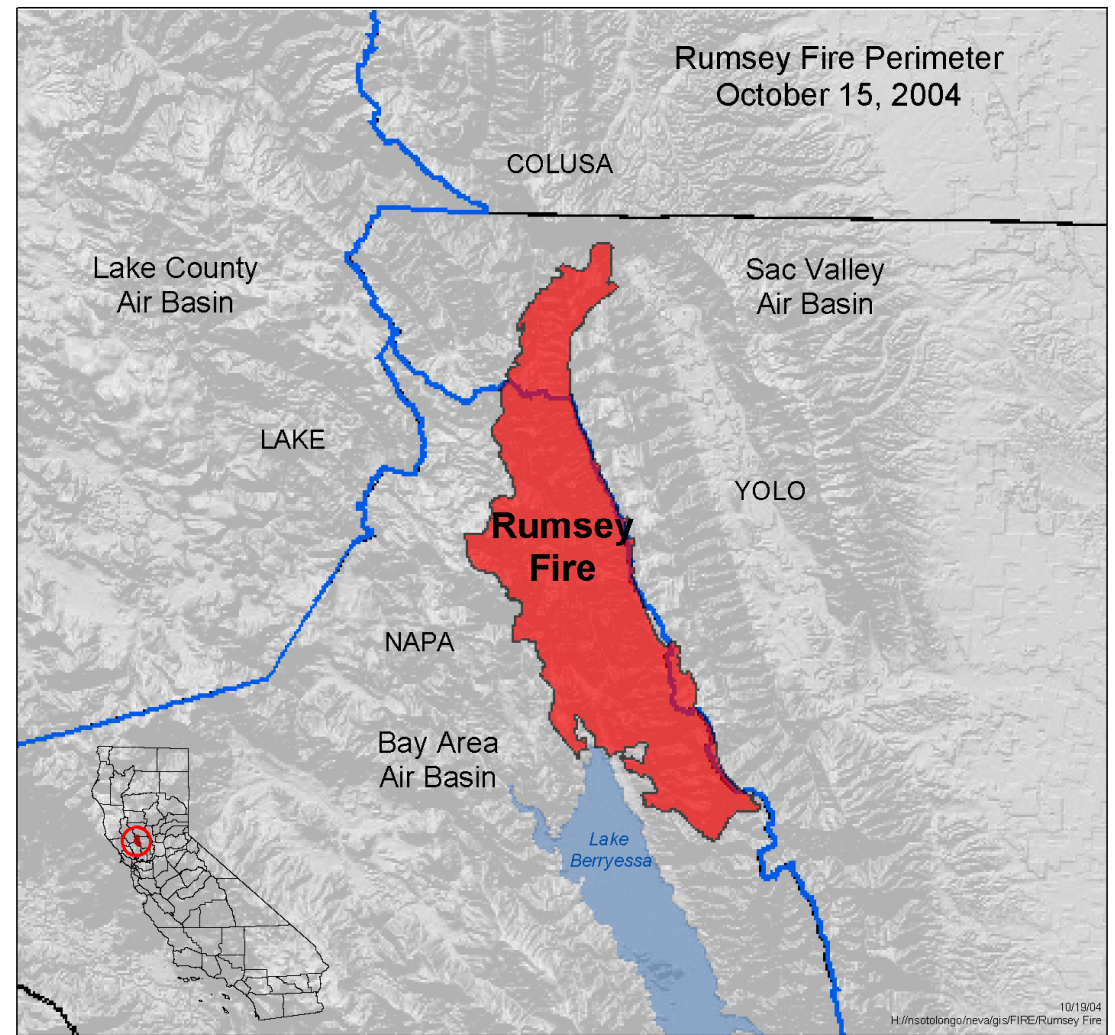
Rumsey Fire

Date: October 10-14, 2004

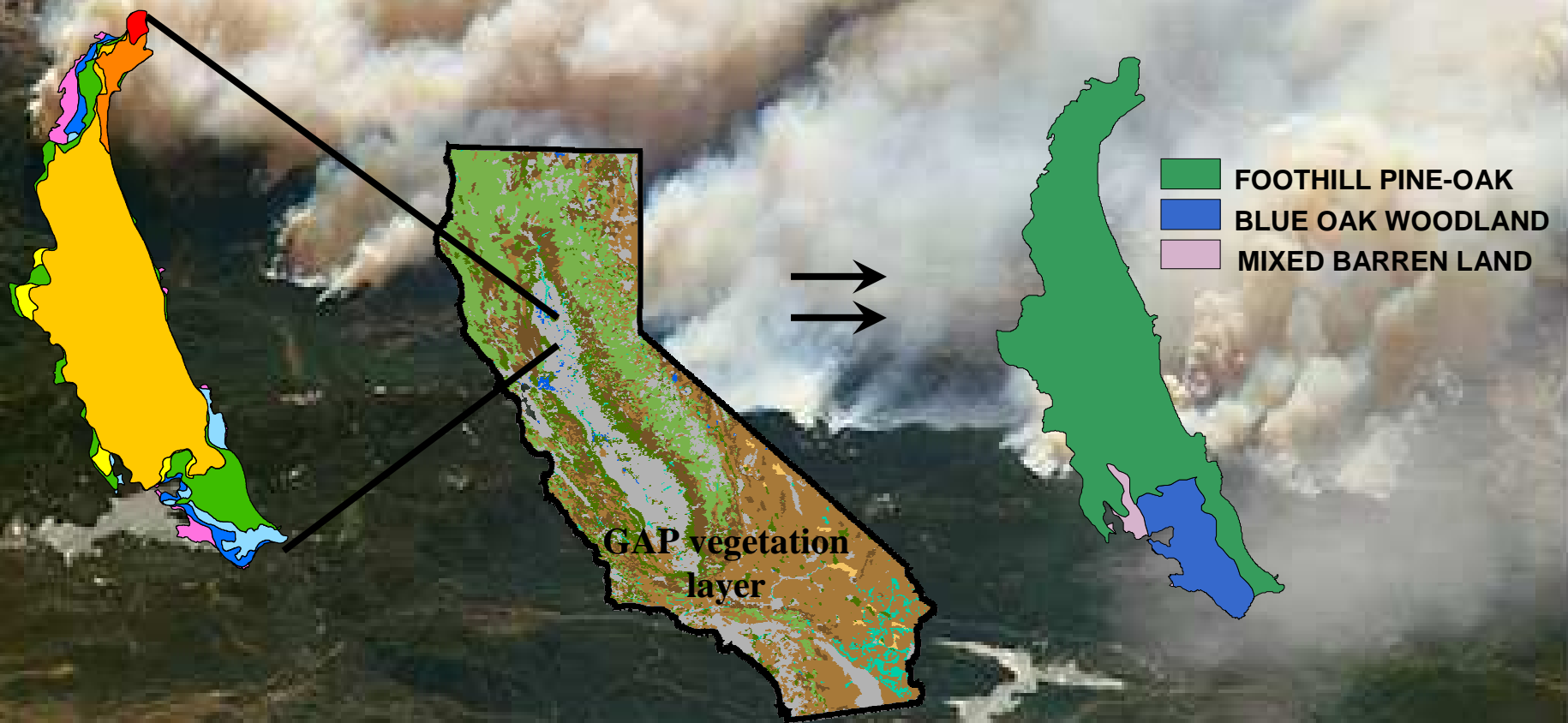
Location: Near the Napa/Yolo County line

Size: ~39,000 acres

Smoked out Bay Area

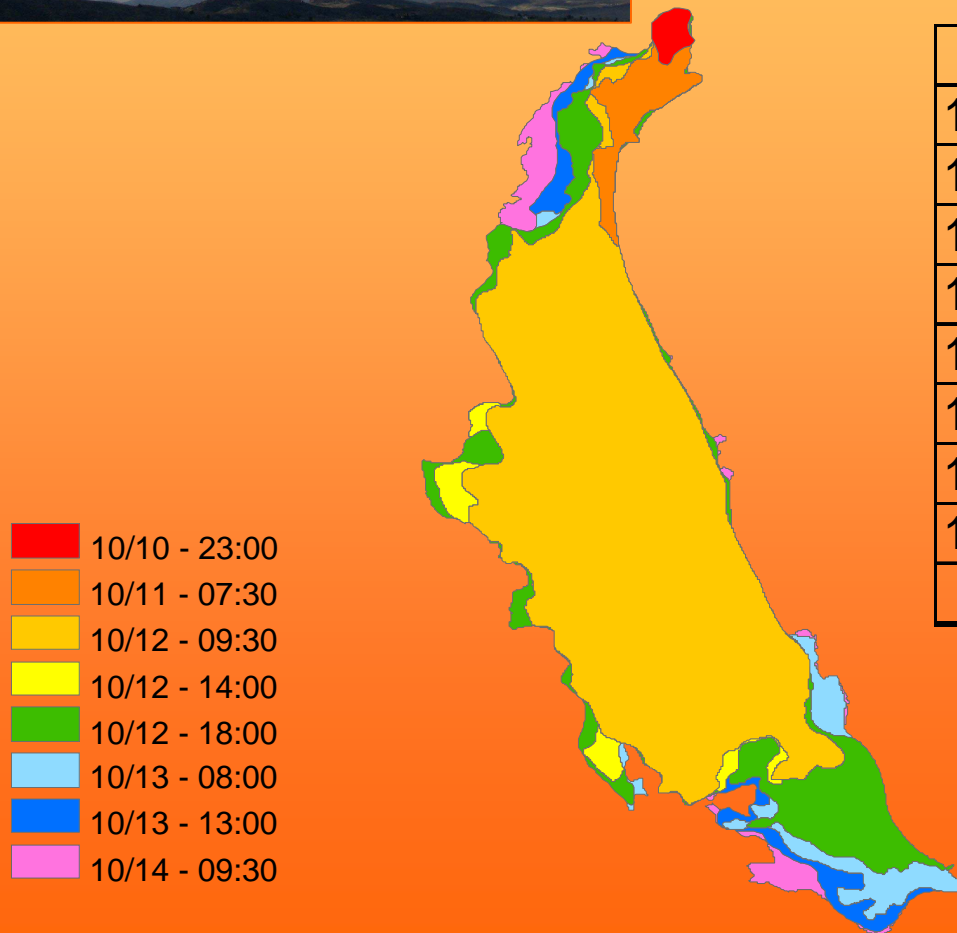


The EES model overlays the wildfire footprint on vegetation GAP layer, calculating the amount of each vegetation type consumed by the fire.



Rumsey Fire

Daily Fire Perimeter



Day and Time	Acres
10/10 - 23:00	380
10/11 - 17:30	1,530
10/12 - 09:30	26,200
10/12 - 14:00	981
10/12 - 18:00	5,396
10/13 - 08:00	1,905
10/13 - 13:00	1,452
10/14 - 09:30	1,549
TOTAL	39,393

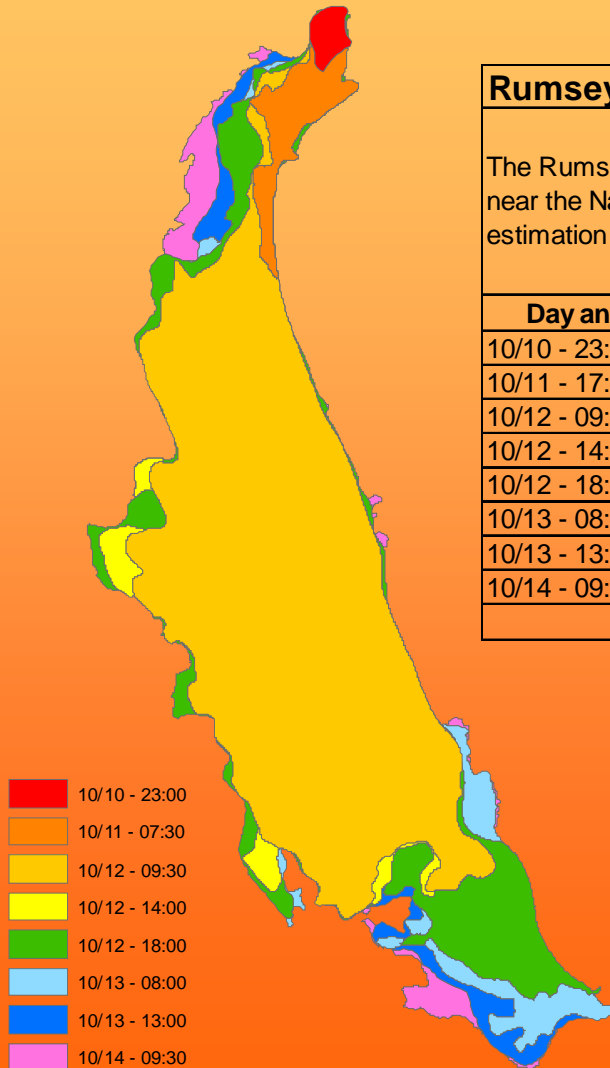


Rumsey Fire Emission Estimates

Rumsey Fire Emission Estimates

The Rumsey fire burned approximately 39,000 acres October 10-14, 2004. The fire was primarily in Napa County near the Napa-Yolo county line. Fire emission were calculated using the ARB's GIS based wildfire emission estimation system (EES) model. Daily

Day and Time	Acres	PM10	PM25	CO	CH4	TNMHC	NH3	NOx	SO2
10/10 - 23:00	380	168	143	1,644	66	115	16	53	16
10/11 - 17:30	1,530	677	574	6,621	265	463	66	213	66
10/12 - 09:30	26,200	10,760	9,130	105,246	4,210	7,367	1,052	3,390	1,044
10/12 - 14:00	981	349	296	3,413	137	239	34	111	34
10/12 - 18:00	5,396	1,715	1,455	16,740	670	1,172	167	544	168
10/13 - 08:00	1,905	499	423	4,861	194	340	49	159	49
10/13 - 13:00	1,452	314	266	3,052	122	214	31	101	31
10/14 - 09:30	1,549	477	404	4,651	186	326	47	152	47
TOTAL	39,393	14,958	12,692	146,228	5,849	10,236	1,462	4,722	1,455





Model Assumptions

- Gridded NFDR-TH moisture - 2000
- FOFEM -100% of area experiences fire
- Set consumption levels
- Dataset limitations
- Spatial distribution – point provided
- Temporal distribution – limited information



Rx vs. Wildfire



- Wildfires
 - Dryer
 - Larger events
 - Longer events
- Rx Burns
 - Better understanding of fuels (heavy, moderate or light)
 - Higher thousand hour fuel moisture
 - Higher RH
 - Smaller events
 - Average 1 or 2 day
- WFUs - conditions similar to wildfires





Projecting Emissions

- Planning
 - Ten-year average - 1994 through 2003 wildfires
 - Normalize erratic annual spatial wildfire distribution
 - Ample yet manageable sample set
 - Adjusts for reporting inconsistencies
 - Consistency and quality data available
- Modeling - methodology not established yet



What's Next

What's Needed



- Planning vs. technical needs
- Update EES Model
 - Vegetation models
 - Review FOFUM 4.0 vs. 5.2
 - More interactive interface
 - Fuel loads and consumption adjustments
 - CO2 output
 - Typical Rx and WF toggle
 - Simplify output tables
 - Update thousand-hour fuel grid
 - Model ready outputs



Inventories



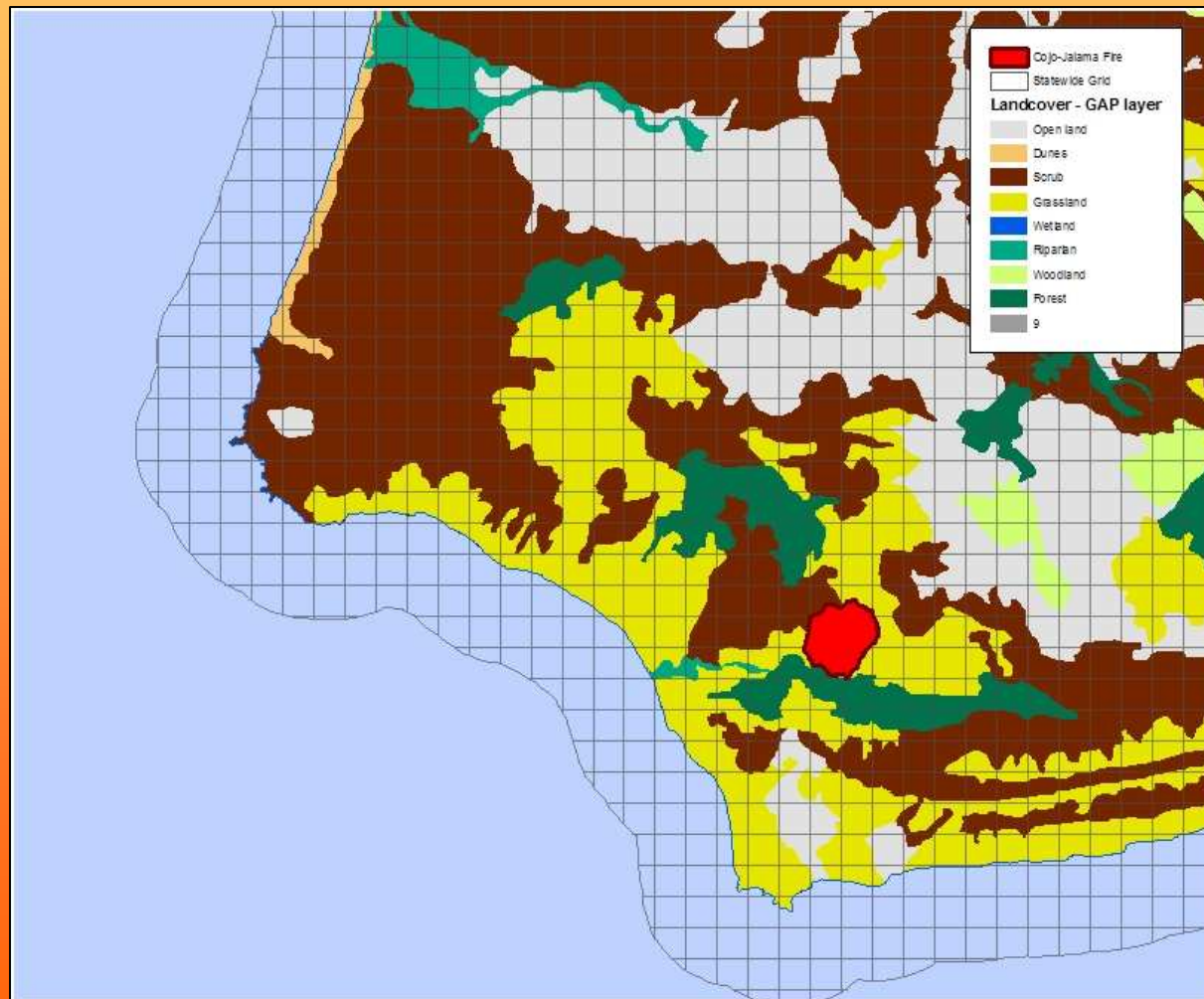


Types of Inventories

- Planning Inventory
 - Monthly by County, Air Basin and District
- Modeling Inventory
 - Daily
 - 4km grid cell statewide
 - Very detailed
 - Diurnal variation – 24 hrs
 - Vertical distribution



Modeling Inventory



Inventory Structure

Sources, Categories and Sub-Categories

Area-Wide Sources

- Managed Burning and Disposal
 - Forest Management – Rx Burns
 - WFU
 - Range Improvement
 - Ag Burning – Pruning and Field
 - Weed Abatement
 - Waste Burning (unspecified)
 - Non-Ag Open Burning
- Residential Wood Combustion — Wood Stoves and Fireplaces
- Fire — Car and Structure Fires

Natural Sources

- Wildfire
- (Biogenics and Geogenics)



AREA SOURCE CATEGORIES

March 2006

UPDATE AUTHORITY - EXPLANATION

D = DISTRICT MUST PROVIDE EMISSIONS, OTHERWISE EMISSIONS ARE ASSUMED TO BE ZERO.
B = ARB DEVELOPS DEFAULT EMISSIONS. DISTRICTS MAY OVERWRITE EMISSIONS, SUBJECT TO
ARB REVIEW AND APPROVAL.
A = ARB DEVELOPS EMISSIONS. DISTRICTS MAY NOT OVERWRITE EMISSIONS.
P = DEPARTMENT OF PESTICIDE REGULATION (DPR) PROVIDES EMISSIONS.

EMISSION SOURCE CATEGORY	UPDATE
EMISSION INV. CODE/EIC DESCRIPTION	AUTHORITY
	CES #

*** AREAWIDE SOURCES ***

MISCELLANEOUS PROCESSES

MANAGED BURNING AND DISPOSAL -----	D
670,660,0262,0000 AGRICULTURAL BURNING - PRUNINGS	47241
670,662,0262,0000 AGRICULTURAL BURNING - FIELD CROPS	47258
670,664,0200,0000 RANGE IMPROVEMENT	47282
670,666,0200,0000 FOREST MANAGEMENT	47274
670,667,0200,0000 WILDLAND FIRE USE (WFO)	90142 B
670,668,0200,0000 WEED ABATEMENT	47266
670,670,0200,0000 NON-AGRICULTURAL OPEN BURNING	47290
670,995,0240,0000 WASTE BURNING (UNSPECIFIED)	82131

*** NATURAL (NON-ANTHROPOGENIC) SOURCES ***

NATURAL SOURCES

WILDFIRES -----	B
930,934,0200,0000 WILDFIRES - ALL VEGETATION	90035





Title 17 Reporting Requirements

Smoke Management Guidelines for Agricultural and Prescribed Burning

Title 17 - California Code of Regulations

Effective: March 14, 2001

§80130. Burning Report.

- (a) A report of agricultural burning, including prescribed burning, conducted pursuant to these Guidelines during each calendar year shall be submitted to the ARB by each air district within 45 days of the end of each calendar year. The report shall include the estimated tonnage or acreage of each waste type burned from open burning in agricultural operations and the estimated tonnage of waste from prescribed burning, and the county where the burning was performed.
- (b) A report of special permits issued pursuant to subsection (e) of section 80120 during each calendar year shall be submitted to the ARB by each air district within 45 days of the end of the calendar year. The report shall include the number of such permits issued, the date of issuance of each permit, the person or persons to whom the permit was issued, an estimate of the amount of wastes burned pursuant to the permit, and a summary of the reasons why denial of each permit would have threatened imminent and substantial economic loss, including the nature and dollar amounts of such loss.
- (c) The ARB Executive Officer may, on a district-by-district basis, alter the frequency or contents of the reports required pursuant to subsections (a) and (b) of this section, based on information needed to conduct or evaluate smoke management programs. The Executive Officer shall provide a justification and reasonable schedule for implementing any revisions.

Reporting Data continued...

- What does ARB need to update emission inventory
 - County, Air Basin and District
 - Year, month, and day
 - Crop code
 - Location information:
 - GIS shapefile
 - Latitude/Longitude
 - Township/Range/Section
 - Address



Meteorology Section

- ARB Meteorology Section Provides:
 - 48 hour meteorology forecast
 - 72 hour meteorology outlook
 - 96 hour meteorology trend
- District - 24 burn decision
- Daily 1:00 conference call – burners & district met staff
- CB3 Forms - “Request for Met Support”- info about burn elevation, location, size, # of days, sensitive areas



Reporting Data continued...

- ARB staff developing Excel spreadsheet
 - Circulate to permitting fire departments
 - Circulate to permitting land management agencies
- Consistency in data format submittals
- Consistent methodology
- Easy to generate emission estimates





Other Related Projects

PFIRS - Prescribe Fire Information Reporting System

Blue Skies - Dispersion Modeling

WRAP-FRAP - Regional Haze

Regional Inventories and Modeling



What's Next What's Needed



- Spatially forecast future WF and Rx emissions
- Rx emission inventory Statewide
- Expand suite of EF for pile burning
- GHG protocols
- Update residential fuel combustion methodology and emissions
- Improve connectivity and exchange between programs



Links to Inventories and Methods

Methods - Smoke Emissions Estimation Web Page:

<http://www.arb.ca.gov/ei/see/see.htm>

Inventory – Almanac (snapshot of CEFS):

<http://www.arb.ca.gov/html/aqe&m.htm>

Inventories- CEIDARS & CEFS:

<http://www.arb.ca.gov/app/emsinv/dist/>



Contact Information

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Lessons

Lesson 1 – Estimate emissions for the Esparza Fire using EES model

Lesson 2 – Digitize fire in Shasta Co. on the fly using EES model

Lesson 3 – Run FOFEM



Esparanza Fire

Location: South Coast AB portion of Riverside County

Date: October 26-28, 2006

Size: ~ 40,000 acres

Elevation: 2,500-4,000 feet

Vegetation: Mostly Chaparral

4 shapefiles from OES ftp server

October 26, 2006 @ 0800 hrs

October 26, 2006 @ 2000 hrs

October 27, 2006 @ 2000 hrs

October 28, 2006 @ 1800 hrs

